

We claim:

1. A catheter for detecting diseased tissue in a hollow body organ, the catheter comprising:

- a. an elongated tubular catheter shaft having a proximal end which
5 remains outside of the body organ when in use and a distal end which
is inserted into the body organ when in use, the distal end having a
light transmission zone through which light can be transmitted;
- b. a fiber lumen in the catheter shaft for containing a diagnostic optical
10 fiber having a distal end terminating within the light transmission zone
for emitting and receiving diagnostic light through the light
transmission zone;
- c. a diagnostic subassembly at the proximal end and in communication
with the diagnostic optical fiber for processing diagnostic light for use
in connection with a diagnostic method for detecting diseased tissue;
- d. an occlusion balloon positioned on the distal end of the catheter shaft
15 adjacent to the light transmission zone;
- e. an inflation lumen in the catheter shaft and in fluid communication
with the balloon for delivering fluid from an inflation fluid source at
the proximal end of the catheter shaft to the balloon;

f. an infusion lumen in the catheter shaft for delivering infusion fluid from an infusion fluid source at the proximal end of the catheter shaft to the distal end of the catheter shaft; and

g. one or more infusion ports formed on or near the light transmission zone and in fluid communication with the infusion lumen for delivering infusion fluid to the hollow body organ.

2. The catheter of claim 1, wherein the plurality of infusion ports are radially distributed around the circumference of the catheter shaft at the light transmission zone.

3. The catheter of claim 1, wherein the plurality of infusion ports are longitudinally distributed along the length of the light transmission zone.

4. The catheter of claim 1, wherein the diagnostic subassembly is configured for use in connection with a diagnostic method selected from the group consisting of optical coherence tomography, fluorescence detection, reflectance spectroscopy, and passive infrared detection.

5. The catheter of claim 1, wherein the diagnostic optical fiber is configured to emit light for exciting fluorescent light and to receive the fluorescent light.

6. The catheter of claim 1, wherein the diagnostic optical fiber is used to receive infrared fluorescence emitted from tissue of the hollow body organ.

7. The catheter of claim 1, wherein the diagnostic optical fiber is in communication with a light source at the proximal end of the catheter shaft and is configured to transmit treatment light to the diseased tissue via the light transmission zone.

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8. The catheter of claim 1, further comprising a second fiber lumen in the catheter shaft for containing a light treatment optical fiber for delivering treatment light from a light source at the proximal end of the catheter shaft to the diseased tissue via the light transmission zone.

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9. The catheter of claim 8, wherein the light treatment optical fiber has a distal end terminating in a diffuser within the light transmission zone.

10. The catheter of claim 1, further comprising a temperature sensing element for sensing temperature in the region of the light transmission zone.

11. A catheter for detecting diseased tissue in a hollow body organ, the catheter comprising:

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a. an elongated tubular catheter shaft having a proximal end which remains outside of the body organ when in use and a distal end which is inserted into the body organ when in use, the distal end having a light transmission zone through which light can be transmitted;

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b. a diagnostic lumen in the catheter shaft for containing a diagnostic device having a distal end terminating within the light transmission

zone for capturing diagnostic information through the light transmission zone;

- c. a diagnostic subassembly at the proximal end and in communication with the diagnostic device for processing the diagnostic information for use in connection with a diagnostic method for detecting diseased tissue;
- d. an occlusion balloon positioned on the distal end of the catheter shaft adjacent to the light transmission zone;
- e. an inflation lumen in the catheter shaft and in fluid communication with the balloon for delivering fluid from an inflation fluid source at the proximal end of the catheter shaft to the balloon;
- f. an infusion lumen in the catheter shaft for delivering infusion fluid from an infusion fluid source at the proximal end of the catheter shaft to the distal end of the catheter shaft; and
- g. one or more infusion ports formed on or near the light transmission zone and in fluid communication with the infusion lumen for delivering infusion fluid to the hollow body organ..

12. The catheter of claim 11, wherein the diagnostic device is an intravascular ultrasound catheter subassembly.

13. The catheter of claim 11, wherein the diagnostic device is an optical coherence tomography catheter subassembly.

14. The catheter of claim 11, wherein the diagnostic device is a fluorescence detection catheter subassembly.

5 15. The catheter of claim 11, wherein the diagnostic device is a catheter subassembly configured for visible or infrared light detection.

16. A catheter for detecting diseased tissue in a hollow body organ, the catheter comprising:

10 a. an elongated tubular catheter shaft having a proximal end which remains outside of the body organ when in use and a distal end which is inserted into the body organ when in use, the distal end having a light transmission zone through which light can be transmitted;

15 b. a first fiber lumen in the catheter shaft for containing a first diagnostic optical fiber having a distal end terminating within the light transmission zone for emitting diagnostic light through the light transmission zone;

20 c. a second fiber lumen in the catheter shaft for containing a second diagnostic optical fiber having a distal end terminating within the light transmission zone for receiving diagnostic light through the light transmission zone;

d. a diagnostic subassembly at the proximal end and in communication with the second diagnostic optical fiber for processing diagnostic light for use in connection with a diagnostic method for detecting diseased tissue;

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e. an occlusion balloon positioned on the distal end of the catheter shaft adjacent to the light transmission zone;

f. an inflation lumen in the catheter shaft and in fluid communication with the balloon for delivering fluid from an inflation fluid source at the proximal end of the catheter shaft to the balloon;

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g. an infusion lumen in the catheter shaft for delivering infusion fluid from an infusion fluid source at the proximal end of the catheter shaft to the distal end of the catheter shaft; and

h. one or more infusion ports formed on or near the light transmission zone and in fluid communication with the infusion lumen for delivering infusion fluid to the hollow body organ.

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17. A catheter for detecting diseased tissue in a hollow body organ, the catheter comprising:

a. an elongated tubular catheter shaft having a proximal end which remains outside of the body organ when in use and a distal end which is inserted into the body organ when in use, the distal end having a light transmission zone through which light can be transmitted;

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- b. a fiber lumen in the catheter shaft for containing a diagnostic optical fiber having a distal end terminating within the light transmission zone for receiving diagnostic light through the light transmission zone;
- c. a diagnostic subassembly at the proximal end and in communication with the diagnostic optical fiber for processing diagnostic light for use in connection with a diagnostic method for detecting diseased tissue;
- d. an occlusion balloon positioned on the distal end of the catheter shaft adjacent to the light transmission zone;
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- e. an inflation lumen in the catheter shaft and in fluid communication with the balloon for delivering fluid from an inflation fluid source at the proximal end of the catheter shaft to the balloon;
- f. an infusion lumen in the catheter shaft for delivering infusion fluid from an infusion fluid source at the proximal end of the catheter shaft to the distal end of the catheter shaft; and
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- g. one or more infusion ports formed on or near the light transmission zone and in fluid communication with the infusion lumen for delivering infusion fluid to the hollow body organ.

18. A catheter for detecting and treating diseased tissue in a hollow body organ, the catheter comprising:

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- a. an elongated tubular catheter shaft having a proximal end which remains outside of the body organ when in use and a distal end which is inserted into the body organ when in use, the distal end having a light transmission zone through which light can be transmitted;
 - b. a first fiber lumen in the catheter shaft containing a diagnostic optical fiber having a distal end terminating within the light transmission zone for emitting and receiving light through the light transmission zone;
 - c. a diagnostic subassembly at the proximal end and in communication with the diagnostic optical fiber for processing diagnostic light for use in connection with a diagnostic method for detecting diseased tissue;
 - d. a second fiber lumen in the catheter shaft for containing a treatment optical fiber for delivering treatment light from a light source at the proximal end of the catheter shaft to the light transmission zone, the treatment optical fiber having a distal end terminating within the light transmission zone for emitting light for treatment of the diseased tissue;
 - e. an occlusion balloon positioned on the distal end of the catheter shaft adjacent to the light transmission zone;
 - f. an inflation lumen in the catheter shaft and in fluid communication with the balloon for delivering fluid from an inflation fluid source at the proximal end of the catheter shaft to the balloon;

g. an infusion lumen in the catheter shaft for delivering infusion fluid from an infusion fluid source at the proximal end of the catheter shaft to the distal end of the catheter shaft; and

h. one or more infusion ports formed on or near the light transmission zone and in fluid communication with the infusion lumen for delivering infusion fluid to the hollow body organ.

19. The catheter of claim 18, wherein the plurality of infusion ports are radially distributed around the circumference of the catheter shaft at the light transmission zone.

20. The catheter of claim 18, wherein the plurality of infusion ports are longitudinally distributed along the length of the light transmission zone.

21. The catheter of claim 18, wherein the diagnostic optical fiber is configured for use in connection with a diagnostic method selected from the group consisting of optical coherence tomography, fluorescence detection, reflectance spectroscopy, and passive infrared detection.

22. The catheter of claim 18, wherein the diagnostic optical fiber comprises an optical fiber configured to emit light of exciting fluorescent light and to receive the fluorescent light.

23. The catheter of claim 18, wherein the diagnostic optical fiber is used to receive infrared fluorescence emitted from tissue of the hollow body organ.

24. The catheter of claim 18, wherein the diagnostic subassembly further comprises a wavelength selective optical element at the proximal end of the one or more optical fibers to filter light received through the one or more optical fibers.

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25. The catheter of claim 18, further comprising a temperature sensing element for sensing temperature in the region of the light transmission zone.